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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
VU, TUAN A	

ART UNIT	PAPER NUMBER
2124	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/044,112	UNGAR, DAVID M.	
	Examiner	Art Unit	
	Tuan A Vu	2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 June 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *20030703*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to the application filed October 24, 2001.

Claims 1-21 have been submitted for examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5, 7, 9-13, and 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers et al., USPN: 6,427,234 (hereinafter Chambers).

As per claim 1, Chambers discloses a method of selecting certain portions of a computer program for compilation, the method comprising:

computing a threshold corresponding to an execution frequency (e.g. col. 35, lines 19-32), such threshold corresponding to a break-even number of executions that recoup computational costs of compilation (e.g. Fig 24; col. 38, line 65 to col. 39, line); and

during execution of the computer program, dynamically compiling individual portions based on correspondence between observed execution for the portions and the threshold (e.g. Fig. 24; col. 38, line 42 to col. 39, line 32).

But Chambers does not specifically disclose that the threshold corresponds to a frequency at which a decreasing hazard rate corresponds to a reciprocal of a break-even point. The determining of a critical frequency threshold where hazard rate (resource disadvantage or hazard such as break-even point disruption) would increase or decrease with respect to the break-even

point has been pointed out by Chambers, i.e. the likelihood of hazard is diminished/decreasing as long as the frequency being monitored (col. 35, lines 30-31) is lower than that of the break-even point, at which point the hazard or disadvantage of the ratio dynamic recompilation versus executing statically compiled code would risk to increase. Hence the limitation of hazard rate is disclosed. However, Chambers does not explicitly disclose that such hazard rate is declining to reach a threshold corresponding to a reciprocal of a break-even point frequency. But based on the rationale by Chambers to allow recompilation when a threshold (based on number of execution increment) is reached (e.g. col. 35, lines 19-32), such reverse proportionality is implied. In case Chambers does not already implement such threshold to correspond to a inverse of break-even frequency, it would be obvious for one skill in the art at the time the invention was made to ensure that the higher the frequency of break-even curve analysis, the less the likelihood that hazard will decrease, i.e. reciprocal between hazard decrease and increase in frequency; because analysis of break-even point is based on frequency of execution as it evolves; and as such frequency reaches some ascending level the risk of damage will stop decreasing and possibly starts to increase as the break-even is broken when Chambers reverts to recompilation.

As per claim 2, Chambers discloses threshold coincident with execution of program and using runtime information (Fig. 24)

As per claim 3, Chambers does not explicitly teach that the hazard rate approximates a probability that a particular portion stop being executed given that it has executed x times; but based on the rationale that after some number of execution frequency being reached so as to determined that it would be less advantageous to go beyond a break-even point (re claim 1), it would be obvious for one skill in the art at the time the invention was made to provide such

hazard likelihood as implied by Chambers so that it corresponds to probability that the execution of the pertinent code portion at such frequency will be stopped because if such execution goes beyond, the disadvantage probability would increase, and more optimization damage would incur, as set forth in the rationale of claim 1.

As per claim 5, Chambers discloses functions, methods of program (e.g. col. 15, line 20 to col. 16, line 35); hence the use of functions analysis for break-even point would have been obvious in view of claim 1.

As per claim 9, Chambers discloses executing a first compiled version and executing a dynamically a second compiled version would have been obvious by virtue of the recompilation analysis by Chambers (re claim 1).

As per claim 10, Chambers teaches optimization on static code prior to submit to dynamic compiler; hence has disclosed second dynamically version being substantially optimized (e.g. Fig 1; Fig. 21B).

As per claim 11, Chambers discloses a executing environment using codes that may optionally be executed in either first or second form, comprising:

dynamic compilation that transform a particular code to a second form, wherein the second form is substantially optimized as compared to a first form (Fig 1; Fig. 21B);

an execution-time measurement of a execution frequency for a particular code that corresponds to an execution frequency (e.g. col. 35, lines 19-32) corresponding to a break-even number of executions that recoup computational costs of compilation (e.g. Fig 24; col. 38, line 65 to col. 39, line); and

wherein the dynamically compilation is responsive to the execution-time measurement (e.g. Fig. 24; col. 38, line 42 to col. 39, line 32).

But Chambers does not specifically disclose that the threshold corresponds to a frequency at which a decreasing hazard rate corresponds to a reciprocal of a break-even point. These limitations have been addressed in claim 1 above.

As per claims 12 and 13, Chambers discloses first form uncompiled and second form compiled (Note: based on claim 11 break-even analysis, dynamically recompiling a portion of code at runtime, such portion being optimized statically --as in Fig. 1 -- reads on the limitation as claimed); the second form being substantially optimized (re claim 9-10)

As per claim 15, Chambers discloses a computer-readable product comprising:

first instructions executable to instrument execution of a computer program; such first instructions providing data indicative of execution frequency for a particular portion (e.g. col. 35, lines 19-32);

second instructions to identify a particular point at which a rate calculated from execution frequency for said portion corresponds to a break-even number of executions that that recoup computational costs of compilation or transformation of optimized form (e.g. Fig 1; Fig 24; col. 38, line 65 to col. 39, line 32).

But Chambers does not specifically disclose that the threshold corresponds to a frequency at which a decreasing hazard rate corresponds to a reciprocal of a break-even point. These limitations have been addressed in claim 1 above.

As per claim 16, refer to claim 2.

As per claims 17-20, Chambers discloses a dynamic compiler (Fig. 1), execution environment (Fig. 1), a computer program (col. 39, lines 33 to col. 40, line 5), a computer medium (Fig. 25).

As per claim 21, this claim is the apparatus version of claim 11; and includes the means for performing the same limitation steps of 'dynamically transforming ...'; and 'measuring execution frequency ... 'of claim 11; hence is rejected with the corresponding rejection as set forth therein respectively.

4. Claims 4, 6-8, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers et al., USPN: 6,427,234; as applied to claim 1, 11; in view of Arnold et al., "Adaptive Optimization of the Jalapeno JVM", Oct. 2000, ACM Sigplan: *Conference on object oriented Programming, Systems, Languages, and Applications*, pp. 1-19 (hereinafter Arnold)

As per claim 4, Chambers discloses a function of resource to compile particular portion (e.g. col. 34, lines 39-41); to execute a compiled version (execution of dynamic region – col. 35, lines 28-29; *statically* - col. 38, lines 65-67); but does not explicitly disclose a function based on executing uncompiled version. However, at the time of the invention it was a well-known concept that Java runtime analysis as to when to compile versus when to execute bytecodes with a JVM in a Just-in-Time mode as mentioned by Chambers (e.g. col. 1, lines 25-41). Such analysis involving recompilation, execution and interpretation was also a known concept at the time the invention was made. Arnold teaches analysis of cost of recompiling of portions of Java code at runtime versus loading for execution of uncompiled codes (e.g. *invoke ... not yet been compiled* - ch. 2, pg. 2-3; ch. 4.3 pg. 6-7) Hence, based on Arnold's JVM interpretation, the execution of uncompiled bytecodes would have been obvious, if such is not implicitly disclosed

by Chambers, because one of ordinary skill in the art would be motivated to add the JIT interpretation resource as a factor in the break-even analysis by Chambers, especially when it is determined that JIT interpreting would be more resource beneficial, such determination would be a beneficial factor in the break-even analysis as intended by Chambers owing to resource saving benefits from the JIT capability as taught by known practices as set forth above.

As per claim 6, Chambers mentions about JIT (re claim 4) but does not disclose bytecodes. The rationale as to why the break-even analysis be applied to a Java runtime optimization would have been obvious by virtue of the rationale of claim 4; hence the limitation of Java bytecodes, an inherent feature of JVM execution engine therein, would also have been obvious owing to the same rationale set forth therein.

As per claim 7, refer to the rationale of claim 4, for the interpretation of uncompiled code limitation.

As per claim 8, the limitation of interpreting a subset and dynamically compiling then executing a second version of the portion would be rejected using the rationale of claim 4.

As per claim 14, Chambers in combination with Arnold, teaches interpretation in JVM with bytecodes (re claim 4)

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan A Vu whose telephone number is (272) 272-3735. The examiner can normally be reached on 8AM-4:30PM/Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571)272-3719.

The fax phone number for the organization where this application or proceeding is assigned is (571) 273-3735 (for non-official correspondence – please consult Examiner before using) or 703-872-9306 (for official correspondence) or redirected to customer service at 571-272-3609.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

VAT
February 13, 2005

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